heat expanded the lower atmosphere, the upper cloud-stratum would be lifted, flattened, and broken into patches, the result being a mackerel sky. Should, however, the expansion in the lower atmosphere take place very slowly, it was possible that the cloud, though thinned, would remain unbroken. Rapid motion of the atmosphere would elongate the cloud in the direction of motion; and, if accompanied by expansion from below, would rupture the cloud into ribs or bars at right angles to the current. If the mass of the cloud were stationary or moving slowly, prominent parts might be drawn out into "mares'-tails."

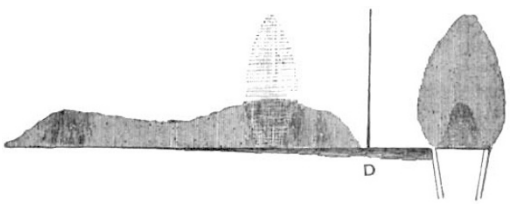
FURTHER EXPERIMENTS ON FLAME

IN my former paper, published in NATURE, vol. xxxi. p. 272, I showed that there are two classes of continuous spectra, viz. those due to an incandescent precipitate, in which case the flame has the power of reflecting and polarising light; and, secondly, flames that possess no reflecting power, but give a soft continuous spectrum without maxima or minima.

Of this second class is carbonic oxide, which gives, at normal pressures, a fairly bright, and at increased pressure, according to Dr. Frankland, a very bright, continuous spectrum. I have observed its spectrum recently under reduced pressure, using an apparatus similar to that described by Dr. Frankland in his "Experimental Researches," p. 884 *et seq.*

I had considerable difficulty at first in keeping the flame alight at anything like low pressures, and finally adopted a glass jet, of a trumpet shape, increasing very gradually from 1 millimetre to 3 millimetres in diameter, the flame being farther shielded from draughts by a wide disk of cork 10 millimetres below the mouth of the jet.

Experiment 1.—Carbonic oxide was burnt in oxygen. The flame was densest close to the jet, and diminished in brightness



Flame of carbonic oxide burning in oxygen at 60 mm. pressure, with spectrum showing maxima. The continuous spectrum at the bottom is given by the red-hot top of the glass jet.

to the tip, without any definite separation into mantles with a space between. At normal pressure every part of it gave a continuous spectrum.

At about 260 millimetres there began to be a noticeable concentration of the light in the violet and the green in the position of the principal bands of the carbon spectrum. At 120 millimetres the concentration was unmistakable, but the spectrum was still continuous. At 60 millimetres it presented the appearance shown in the sketch. There appeared to be a second maximum in the green—not, however, at all well defined—but the principal maximum was continued upwards into a faint green cloud corresponding to the very faint tip of the flame; this cloud was perfectly isolated, but, unlike the carbon bands, was brightest in the middle.[1] I failed to see a similar cloud over the maximum in the violet, but this might be owing to insufficient light, my pumps being only able to maintain so high a vacuum against a very small flame. Mr. T. Legge, of Trinity, who was with me, observed that the comparative absence of the blue was very remarkable.

My supply of oxygen becoming exhausted, I had to use air. The flame became less bright, and the maxima less marked. By turning it very low, we brought the gauge down to 40 millimetres. The flame still burnt steadily.

Finally, at 60 millimetres pressure, I adjusted the flame to a height of three-quarters of an inch, opened the air-taps, and checked the pumps. The flame increased in brightness and decreased in size to rather more than a quarter of an inch at normal pressure, the spectrum becoming again perfectly continuous.

[1] It is impossible in a woodcut to give a true idea of the extreme faintness of this isolated cloud. It is only visible when the brighter part of the spectrum is hidden from the eye, and the room is perfectly dark.

Experiment 2.—Having the apparatus ready, I repeated Dr. Frankland's experiment of burning coal-gas in air under reduced pressure. He says that "finally, at 6 inches pressure, the last trace of yellow disappears from the summit of the flame, leaving the latter an almost perfect globe of a peculiar greenish-blue tint."

He used a jet contracted at the mouth to 1·5 millimetres. With my much wider trumpet-shaped jet, by turning on more gas I could produce smoke at 160 millimetres so as to blacken the glass chimney. At 120 millimetres the light was noticeably less vivid, the flame having a diluted appearance, but the spectrum showed the usual carbon lines much more sharply defined, the mantles being very much thicker than at normal pressure. With this exception there was no difference caused by the reduction of the pressure to 60 millimetres, and even then, on turning up the gas a little, the ellipsoidal flame became pointed, and the yellow light, giving the incandescence spectrum, re-appeared in the tip of it. It is evident that the trumpet-shaped jet allows carbon to be precipitated in the flame at much lower pressures than the contracted jet. In the same way alcohol heated in a bulb tube burns from the mouth of it with a bright and even smoky flame, whereas it burns from a wick with a blue one.

One phenomenon observed by Dr. Frankland I was disappointed not to see. He says: "Just before the disappearance of the yellow portion of the flame there comes into view a splendid halo of pinkish light forming a shell half an inch thick around the blue-green nucleus; . . . the colour of this luminous shell closely resembles that first noticed by Gassiot in the stratified electrical discharge passing through a nearly vacuous tube containing a trace of nitrogen." He does not speak of having used the spectroscope to determine the nature of this pink glow.

I went considerably below the lowest pressure mentioned in his paper, viz. 4·6 inches, but entirely failed to reproduce it. But I have noticed that very small flames from capillary tubes, observed under a power of 100 in the microscope, are sometimes tinged with rose-colour in the outer mantle, from a very faint trace of sodium orange light mingling with the blue of the soft outer mantle; and I think that the jet he used or the glass chimney may have been sufficiently heated to give a rosy tinge to the flame.

One other point I would call attention to. The appearance of the gas-flame at low pressures is precisely like that of a very small gas-flame under the microscope. The inner mantle appears to be bordered with bright green light, due to the principal green band of the carbon spectrum extending slightly beyond the others. Beyond this, again, comes a zone of violet light due to the band in the violet, and in most cases this extends nearly, if not quite, to the outer mantle. At ordinary pressures this can only be seen with a magnifying-glass, except with a special burner; but the *in vacuo* flame is, as it were, magnified as to its structure, which is thus visible to the naked eye. This fact suggests that flames may in a sense obey Boyle's law, *i.e.* that the space required for complete combustion under given conditions varies inversely as the pressure. I am continuing my experiments. GEORGE J. BURCH

SOCIETIES AND ACADEMIES

LONDON

Royal Society, November 18.—"The Coefficient of Viscosity of Air. Appendix." By Herbert Tomlinson, B.A. Communicated by Prof. G. G. Stokes, P.R.S.

In the previous experiments by the author on this subject, the coefficient of viscosity of air was determined from observations of the logarithmic decrement of amplitude of a torsionally vibrating wire, the lower extremity of which was soldered to the centre of a horizontal bar. From the bar were suspended vertically and at equal distances from the wire a pair of cylinders, or a pair of spheres. The distances of the cylinders or spheres from the wire were such that the *main* part of the loss of energy resulting from the friction of the air may be characterised as being due to the *pushing* of the air.

Acting on a suggestion of Prof. Stokes, the author proceeded to determine the coefficient of viscosity of air by suspending a hollow paper cylinder about 2 feet in length and half a foot in diameter, so that its axis should coincide as to its direction with the axis of rotation. The cylinder was supported by a light hollow horizontal bar, about 7 inches in length, to the centre of which the vertically suspended wire was soldered. The wire

was set in torsional vibration, and the logarithmic decrement determined with the same precautions as before.

The following were the results :—

Vibration-period in seconds	Coefficient of viscosity of air in C.G.S. units, μ	Temperature in degrees Centigrade
3·6038 ...	0·00017708 ...	12·225
8·8656 ...	0·00017783 ...	13·075

In these experiments the loss of energy arising from the friction of the air may be characterised as being due to the *dragging* of the air, and it is very remarkable that there should be such close agreement in the values of μ as determined by this and the previous methods. The mean value of the coefficient of viscosity of air obtained by this method is 0·00017746 at a temperature of 12°·650 C., and the mean value deduced from the previous experiments when proper correction has been made for the rotation of the spheres and cylinders about their axes is 0·00017711 at a temperature of 11°·79 C.

November 25.—"On the Structure and Life-History of *Entyloma Ranunculi* (Bonorden)." By H. Marshall Ward, M.A., F.L.S., Fellow of Christ's College, Cambridge, and Professor of Botany in the Forestry School, Royal Indian College, Cooper's Hill.

The author found plants of *Ranunculus Ficaria*, the leaves of which were spotted with white patches; the white patches spread from leaf to leaf, and the disease assumed the nature of an epidemic over a given area under examination. The rise, progress, and climax of the disease were observed both on isolated plants and in the open country, and the nature of the lesions in the leaves was made out. Some plants were found to succumb more rapidly; the evidence supporting this conclusion was given, and the circumstances to which the differences are due explained.

The white disease-spots contain the mycelium of *Entyloma Ranunculi*, and the resting-spores of this fungus (one of the Ustilagineæ) were observed on it. The mycelium is very delicate and septate, and runs in the middle lamellæ between contiguous cells. The white powder on the outside of the disease-spot consists of conidia, very like those of some Ascomycetes. The author examined the anatomical connection between the conidia and the resting-spores, and showed that the conidia really belong to the same mycelium—in other words, the conidia are a second kind of spore of the *Entyloma*.

Even more important is the germination of these conidia: this has not been before observed in any *Entyloma*. The germination was traced step by step, not only on glass slips, but also on the living plant. Artificial infections were made, and it was shown how the germinal hyphæ entered the stomata, and produced a mycelium exactly like that in the disease-spots first investigated; not only so, but the *resting-spores of the Entyloma were produced on this mycelium*, thus placing beyond doubt the connection of the two spores. The time occupied in infection was also determined in many cases. Moreover, all the symptoms of the disease produced by infection with the conidia were as before. The paper was illustrated by diagrams, and specimens of the fungus were exhibited under the microscope.

Mathematical Society, December 9.—Sir J. Cockle, F.R.S., President, in the chair.—Prof. D. Y. Kikuchi, of Tokio, was elected a Member, and Mr. F. S. Macaulay admitted into the Society.—The following communications were made :—The linear partial differential equations satisfied by pure ternary reciprocants, by E. B. Elliott.—Circular notes, by R. Tucker.—The problem of the duration of play, by Capt. Macmahon, R.A.—Note on two annihilators in the theory of elliptic functions, by J. Griffiths.—Mr. Hammond spoke upon the subject of Capt. Macmahon's communication at the November meeting.

Linnean Society, December 2. — William Carruthers, F.R.S., President, in the chair.—The following gentlemen were elected Fellows of the Society, Messrs. J. W. Willis Bund, Arthur Dendy, Anthony Gepp, Tokutaro Ito, F. Krause, F. M. Lascelles, Fred Sander, R. von Lendenfeld, John Samson, Harry S. Burton, A. W. Sutton, and Chas. W. Wilson; afterwards Mr. Geo. Sim was elected an Associate.—The President read a letter from the Rev. M. J. Berkeley, concerning the death of his old and respected co-worker on fungi, Mr. C. E. Broome.—Mr. G. Maw exhibited ten photos of living Narcissi, made in the Riviera in 1870. He afterwards gave a short account of the North African and South Spanish Narcissi as observed by him on a recent visit thither. The *Narcissus papyraceus* extends as far as Fez, in Morocco; south of that *N. sub-Broussoneti* takes its place, and is found from Saffi to Mogador. Incidental allusion was made to the smallest of the white forms of *N. Tazzetta* in the Island of Teneriffe. Of the autumnal species, reference was made to *N. nudiflorus*, which had been lost sight of for half a century, but was re-discovered by Mr. Maw in 1883 in the neighbourhood of Gibraltar, and again recently near Tangier. A hybrid between *N. viridiflorus* and *N. serotinus* was found by him close to Gibraltar, and a series of hybrids between *N. viridiflorus* and *N. elegans* were got in North Morocco. Mr. Maw stated that *N. serotinus* was limited to the south of Spain, and *N. elegans* to the Morocco coast, the latter plant bearing true leaves. He mentioned the abundance in flower and fruit of a small Amaryllid, *Tapeinanthus humilis*, Herbert, as occurring eight miles south of Tangier.—Dr. Day read a paper on the Lochleven trout, which is the form that has been utilised by Sir James Maitland at Howietoun, where the elevation is similar to that of their original home, distant about 25 miles. These fish are known by their numerous cæcal appendages, and up to their fourth or fifth year they are of a silvery gray, with black, but no red, spots. Subsequently they become of a golden purple with numerous black and red spots. Undergrown ones take on the colour of the burn trout. Remove these fish to a new locality, and they assume the form and colour of the indigenous trout. In 1883 a salmon parr and Lochleven trout were crossed, and the young have assumed the red adipose dorsal fin, and the white-edged margins to the dorsal and ventral, also the orange edges to both sides of the caudal—all colours found in the brook trout, but not in the salmon or Lochleven trout. The maxilla in this form not extending to behind the eye, the absence of a knob on the lower jaw in old breeding males and the difference in the fins from those of *Salmo fario* were shown to have been erroneous statements.—A paper was read on Hermann's "Ceylon Herbarium" and Linnæus's "Flora Zeylanica," by Dr. Henry Trimen. The collection of dried plants and the drawings of living ones made in Ceylon by Paul Hermann in the latter half of the seventeenth century possess a special interest as being the first important instalment of material towards a knowledge of the botany of the East Indies; but Hermann himself, who died in 1695, published very little of this material. Some of his manuscripts were subsequently printed by W. Sherard, including a catalogue of the herbarium, as then existing, under the title of "Museum Zeylanica" (1717). This herbarium was lost sight of till 1744, when it was recognised by Linnæus in a collection sent to him from Copenhagen. After two years work at it, Linnæus produced in 1747 his "Flora Zeylanica," in which all the plants that he could determine are arranged under his genera. At that date Linnæus had not initiated his binomial system of nomenclature; but in his subsequent systematic works he quoted the numbers of the "Flora Zeylanica," and thus Hermann's specimens became the types of a number of Linnæus's species, for the most part additional to those in his own herbarium in the possession of the Linnean Society.

Zoological Society, December 7.—Prof. W. H. Flower, F.R.S., President, in the chair.—Prof. Bell exhibited and made remarks on a specimen of a rare Entozoon (*Tænia nana*) from the human subject.—Mr. Tegetmeier exhibited and made remarks on a pair of antlers of a Deer, said to have been recently obtained in the Galtee Mountains in Ireland. They appeared to be those of the Elk (*Alces machlis*).—Mr. Frank E. Beddard read a paper on the development and structure of the ovum in the Dipnoan fishes. The present communication was a continuation of a research into the structure of the ovary in *Protopterus*. The author, besides being able to give a more complete account of the ovarian ova of *Protopterus*, was also able to supplement this account with some further notes respecting the structures observed in the ovary of *Ceratodus*.—Mr. A. Smith-Woodward read a paper on the anatomy and systematic position of the Liassic Selachian, *Squaloraja polyspondyla*. After a brief notice of previous researches, the author attempted an almost complete description of the skeletal parts of *Squaloraja*, as revealed by a fine series of fossils in the British Museum. He confirmed Davies's determination of the absence of the cephalic spine in certain individuals (presumably females), and added further evidence of its prehensile character, suggesting also that the various detached examples afforded indications of one or more new species. The author concluded with some general

remarks on the affinities of the genus, and proposed to institute a new family, "Squalorajidæ," which might be placed near the Pristiophoridæ and Rhinobatidæ.—Mr. Sclater, F.R.S., pointed out the characters of an apparently new Parrot of the genus *Conurus*, from a specimen living in the Society's Gardens. The species was proposed to be called *Conurus rubritorquis*.—Mr. F. Day, F.Z.S., communicated (on the part of Mr. J. Douglas Ogilby, of the Australian Museum, Sydney) a paper on an undescribed fish of the genus *Pimelopterus* from Port Jackson, N.S.W., proposed to be named *P. meridionalis*.—Mr. G. A. Boulenger read a paper on the South African Tortoises allied to *Testudo geometrica*, and pointed out the characters of three new species of this group, which he proposed to call *Testudo trimeni*, *T. smithii*, and *T. fiski*.—A second paper by Mr. Boulenger contained some criticisms on Prof. W. K. Parker's paper "On the Skull of the Chameleons," read at a previous meeting of the Society.—Mr. Oldfield Thomas read a paper on the Wallaby, commonly known as *Lagorchestes fasciatus*, and showed that the dentition of this animal was entirely different in character, not only from that of the typical species of *Lagorchestes*, but even from that of all the other members of the sub-family Macropodinæ. He therefore proposed to form a new genus for its reception, to which he gave the name of *Lagostrophus*.—A communication was read from Prof. R. Collett, C.M.Z.S., containing the description of a new Pouched Mouse from Northern Queensland, which he proposed to name *Antechinus thomasi*.

Geological Society, November 17.—Prof. J. W. Judd, F.R.S., President, in the chair.—The following communications were read:—A letter from the Lieutenant-Governor of the Falkland Islands, communicated by H.M. Secretary of State for the Colonies, and printed in NATURE, vol. xxxiv. p. 440.—On the drifts of the Vale of Clwyd, and their relation to the caves and cave-deposits, by Prof. T. McKenny Hughes, M.A., F.G.S. The author divided his subject as follows:—I. Introductory remarks; II. the Drifts, viz. (i.) the Arenig Drift, (ii.) the St. Asaph Drift, (iii.) the Surface Drifts; III. the caves, viz. (i.) the caves themselves, (ii.) the cave-deposits; IV. conclusion. He exhibited a table showing the tentative classification he proposed. II. (i.) The Arenig Drift, he said, might be called the *Western Drift*, as all the material of which it was composed came from the mountains of Wales; or the *Great Ice-Drift*, as it was the only drift in the vale which contained evidence of direct ice-action. He traced its course from the Arenig and Snowdon ranges by striæ on the solid rock and by the included fragments, a large proportion of which were glaciated. There are no shells in this drift. II. (ii.) The St. Asaph Drift might, he said, be called the *Northern Drift*, as it was the deposit in which fragments of north-country rocks first appeared; or the *Marine Drift*, as it was, excepting the recent deposits at the mouth of the estuary, the only drift in the vale which showed by its character and contents that it was a sea-deposit. It contained north-country granites, flints, and sea-shells, of which he gave lists. Most of them are common on the adjoining coast at the present day; a few are more northern forms. None of the rocks are striated, except those derived from the Arenig Drift (i.). II. (iii.) The Surface-Drifts included the older and newer alluvia of the rivers, the Morfa Rhuddlau Beds or estuarine silt, the recent shore-deposits or Rhyl Beds, and all the various kinds of deposits known as talus, trail, rain-wash, head, run-of-the-hill, &c., of which, in so long a time, very thick masses have accumulated in many places. He explained some methods of distinguishing gravels according to their origin. Turning to the subject of caves, he thought they should be careful not to confound (III. i.) the question of the age and origin of the caves themselves with (III. ii.) that of the deposits in the caves. He then described some of the more important caves of the district, explaining the evidence upon which he founded the opinion that the deposits in Pontnewydd Cave were post-glacial palæolithic. He arrived at the same conclusion with regard to the deposits in the Ffynnon Beuno Caves. Combating the objections to this view which had recently been urged, he pointed out that the drifts associated with the deposits in those caves cannot have been formed before the submergence described under II. (ii.), because they contained north-country fragments and flints, and that, even if they were of the age of the submergence, they would not be pre-glacial; that they cannot have been formed during the submergence, as the sea would have washed away the bones, &c., from the mouth of the cave, and its contents must have shown some evidence of having been sorted by the sea. He considered that the greater part of the material that blocked the upper entrance of the upper cave belonged to the surface-drifts described under II. (iii.), and were, as they stood, almost all sub-aërial. He further pointed out that, so far as palæontologists had been able to lay before them any chronological divisions founded on the Mammalia, the fauna of the Ffynnon Beuno Caves agreed with the later rather than with the earlier Pleistocene groups.

Middlesex County Natural History Society, November 16.—Dr. Archibald Geikie, F.R.S., in the chair.—A paper was read by Mr. Sydney T. Klein, entitled "Thirty-six Hours' Hunting amongst the Lepidoptera and Hymenoptera of Middlesex, with Notes on the Methods adopted for their Capture." The especial object of the paper was to show how much good work could be done in a short time and within a small space—the time being made up by an hour or so each evening, and the space being the author's garden at Willesden. Detailed observations on the methods of enticement and capture—such as the rearing of special food-plants, sugaring, bright lights, &c.,—were entered into, and a list of the Noctuæ captured was read. Mr. Klein stated that he had taken over 170 species in the short time at his disposal, and had noticed, on an average, 500 or more moths on each occasion. With regard to the Hymenoptera, both mason and leaf-cutter bees had established themselves in his garden, and some interesting observations on their habits and economy were given. A large collection, containing specimens of every insect taken, was exhibited, together with the ichneumons peculiar to several of the species; a torpid mason-bee, which was restored to activity by breathing; and cells of the queen of the Ligurian honey-bee. A discussion followed, in which the Chairman joined; and, with a few remarks by the other members who had brought exhibits, a vote of thanks to Dr. Geikie brought the meeting to a close. Another paper, "On the Flora met with on the occasion of the Highgate Excursion," by Dr. Henry Wharton, was postponed till the December meeting.

CAMBRIDGE

Philosophical Society. Oct. 25.—Annual General Meeting.—Prof. Foster in the chair.—The following were elected Officers and new Members of Council for the year:—President: Mr. Trotter; Vice-Presidents: Prof. Babington, Prof. Adams, Prof. Foster; Secretaries: Mr. Glazebrook, Mr. Vines, Mr. Larmor; new Members of Council: Prof. Liveing, Mr. Forsyth, Mr. Marr, Mr. Pattison Muir.—Mr. Trotter then took the chair, and the following communications were made to the Society:—On Lagrange's equations of motion, by Mr. J. C. McConnel. The paper contains a proof of Lagrange's equations founded on that in Lord Rayleigh's "Theory of Sound," with some remarks on the proof given in Maxwell's "Electricity and Magnetism."—On the potentials of surfaces formed by the revolution of limaçons and cardioids about their axes, by Mr. A. B. Basset. The potential of a spheroid can be expressed in terms of a series of spheroidal harmonics. From this by inversion with respect to a focus the potential of limaçon is found, while that of a cardioid is obtained from a paraboloid either in a similar manner or by treating it as the limiting case of the spheroid.—An attempt to explain certain geological phenomena by the application to a liquid substratum of Henry's law of the absorption of gases by liquids, by Rev. O. Fisher. The author supposes that a liquid substratum exists beneath the earth's crust, and that this consists of fused rock holding gas, chiefly water above its critical temperature, in solution. This water is supposed to be that which is given off so largely in volcanic eruptions. If such be the constitution of the substratum, the reactions between it and the crust will largely depend on it, and also the tidal effects. The problem is worked out in the paper, and numerical results, which accord fairly with observed facts, are obtained.—A new method of determining specific inductive capacity, by Mr. L. R. Wilberforce. The author briefly described the method, which consisted in the comparison of the directive couples upon two spheroids, the one made of the dielectric to be investigated, and the other of some conducting material, when they were placed in a uniform electric field. He further indicated certain theoretical considerations with regard to the eccentricities of the spheroids and their manner of suspension, and stated a general theorem relating to the mechanical effect due to such a field upon a body of any material or form.

PARIS

Academy of Sciences, December 6.—M. Daubrée in the chair.—Reply to M. de Lapparent's note of November 22, on the

conditions determining the form and density of the earth's crust, by M. Faye. The conclusions of modern physicists regarding the uniform flattening of both terrestrial poles are vindicated against M. de Lapparent's captious objections. The general charge that the work of geodesy is far from completed is admitted; but it is pointed out that, in order to continue this work, it is not necessary to sweep away the secure results already obtained; it will be safe to prosecute it on the safe lines already laid down by Sabine, Freycinet, Foster, Clarke, Lütke, and other eminent men of science.—Action of manganese on the phosphorescent property of carbonate of lime, by M. Edmond Becquerel. The experiments here described place in a clear light the action of manganese, explaining how the carbonate of lime derived from the solution of Iceland-spar in pure hydrochloric acid always leads to preparations of orange phosphorescent sulphurets, while the phosphorescent matter is always bright green when the carbonate of lime used in the preparation is aragonite.—On the nitric substances of vegetable soil, by MM. Berthelot and André. A first series of experiments is here described, which have been carried out in the presence of diluted hydrochloric acid for the purpose of determining the chemical constitution of the nitric substances found in all vegetable soils in association with carbon, hydrogen, and oxygen, and almost absolutely insoluble.—On the composition of cider, by M. G. Lechartier. A quantitative analysis is given of the various ciders at present consumed in Paris, and coming chiefly from Normandy and Brittany. The results show an average proportion of alcohol lying between 5·1 and 9·40 per cent.—On the red fluorescence of alumina, by M. Lecoq de Boisbaudran. These experiments show that the presence of chromium appears to be indispensable for the production of the red fluorescence of alumina. There seems to be a complete analogy between the parts played by chromium and all other active substances, such as Mn, Bi, Zα, Zβ or Sm.—Report made, in the name of the Section of Physics, in reply to a letter of the Minister of Public Instruction, Fine Arts, and Worship on sundry questions connected with the establishment of lightning-conductors on the buildings of the Lyceums (Commissioners: MM. Becquerel, Berthelot, Cornu, Mascart, Lippmann, and Fizeau). The report considers it indispensable for complete safety to have all iron roofs, doors, sashes, pipes, &c., carefully connected with the general apparatus usually attached to these buildings as protections against electric discharges.—On the fundamental principles of the higher geometry, by M. A. Mouchot. To generalise the figures of geometry by assigning them well-defined imaginary points, and then to prove that the algebraic symbols express all the relations of magnitude or position between the elements of these figures, is the double problem which has engaged the attention of the author for the last thirty years, and a rational and complete solution of which is now submitted to the Academy.—On certain problems in which are considered, on a plane curve, arcs of the same origin traversed in the same time as the corresponding chords, by M. G. Fouret.—On a new testing exploder ("exploseur-vérificateur") of quantity and tension, by MM. Louis de Place and Bassée-Crosse. This apparatus consists of a moist pile of the Place-Germain system, an induction bobbin, and a telephone. It is described as very handy, portable, and durable, advantageously replacing the exploders of quantity and the exploders of tension. It also verifies the circuits at any given moment without danger of premature explosion.—Calorimetric researches on the specific heats and changes of state at high temperatures, by M. Pionchon. In this first communication the author gives, in tabulated form, the results of his calorimetric studies for silver, tin, iron, nickel, and cobalt. His experiments fully confirm the opinion already announced by M. Berthelot on the so-called law of Dulong and Petit.—On the tensions of vapour of solutions made in ether, by M. Em. Raoult. The tensions of vapour for the solutions here determined by Dalton's method show that the molecular diminutions of tension are always comprised between 0·67 and 0·74, with a general average of 0·71, whatever be the composition, chemical function, and molecular weight of the substances held in solution.—Researches on the bi-metallic phosphates and allied salts, and on their transformations, by M. A. Joly.—Saturation of normal arsenic acid by magnesia, and formation of ammoniaco-magnesian arseniate, by M. Ch. Blarez. These researches on the formation of the arseniates of magnesia and of ammoniaco-magnesian arseniate have been undertaken for the purpose of completing the author's studies on the saturation of normal arsenic acid.—On the phenomena attending the heating and cooling of cast steel, by M. Osmond. In continuation of his studies of these phenomena between the normal temperature and 800° C. the author here gives the results of his researches brought up to 1200° C.—On the influence of silicium on the state of the carbon in pig-iron, by M. Ferdinand Gautier. The experiments already carried out by Messrs. Stead and Wood, of Middlesbrough, are here repeated under somewhat altered conditions and with analogous results.—On the water of combination of the alums, by M. E. J. Maumené.—Heat of neutralisation of the meconic and mellic acids, by MM. H. Gal and E. Werner.—A contribution to the study of the fossil fruits of the Eocene flora in the west of France, by M. Louis Crié.—On the diseases of the olive, especially tuberculosis, by M. L. Savastano.—On the phenomenon of the green ray, by M. de Maubeuge. The author's repeated observations of this well-known phenomenon, both at sunset and sunrise under varying atmospheric conditions, lead him to conclude that it is really objective, and not merely a subjective sensation.—The Indo-European Canal and the navigation of the Euphrates and Tigris, by M. Emile Eude. It is suggested that with a capital of about 60,000,000*l.* a canal available both for navigation and irrigation might be constructed from the Mediterranean to the Persian Gulf, shortening the route to India by six days.

BOOKS AND PAMPHLETS RECEIVED

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